P-ISSN: 2617-9806
E-ISSN: 2617-9814

Impact Factor: RJIF 5.2
www.nursingjournal.net

International Journal of Advance Research in Nursing

Volume 2; Issue 1; Jan-Jun 2019; Page No. 204-214

Received: 13-11-2018
Accepted: 15-12-2018

Indexed Journal
Peer Reviewed Journal

Pulmonary rehabilitation based care bundle for patients with chronic obstructive pulmonary disease

Mona Mohamed Ibrahim and Monira Samir Abdelhady

Lecturer, Medical Surgical Nursing, Faculty of Nursing Aswan University, Egypt

Abstract

Background: Dyspnea, shortness of breathing and fatigue are the most common symptoms experienced by patients with COPD.

Aim: To assess the effectiveness of pulmonary rehabilitation as practiced based care bundle on improving dyspnea, fatigue, functional status, quality of life and knowledge for patients with chronic obstructive pulmonary disease.

Design: Quasi experimental (pre posttest control trial). Setting: Chest Department, Aswan University Hospital.

Subjects: A purposeful sample of100 patients suffering from COPD divided into two groups (Study and control)

Tools: 7 tools were used: (I) Socio-demographic and medical clinical base line data, (II) St. George's Respiratory Questionnaire (SGRQ), (III) The University of California, San Diego (UCSD) Shortness of Breath Questionnaire, (IV) The Medical Research Council (MRC) Breathlessness Scale, (V) Dyspnea-12 Questionnaire, (VI) The Multidimensional Fatigue Symptom Inventory Short Form (MFSI-SF) and (VII) Bristol COPD knowledge questionnaire (BCKQ).

Results: All of the studied patients had unsatisfactory knowledge and the minority of them had unsatisfactory practices regarding dyspnea and fatigue management before the pulmonary rehabilitation program, which improved after the program intervention with a highly significant differences. The breathlessness, fatigue and shortness of breathing improved in patients with COPD who received the program.

Conclusions: Implementation of the pulmonary rehabilitation program had improved COPD patients' level of knowledge, dyspnea, dimensions of fatigue and shortness of breathing and breathlessness level.

Recommendations: Conducting comprehensive rehabilitation programs for patients with COPD in outpatients' clinics with simplified printed guidelines through leaflets or brochures explaining how to prevent and control breathlessness and fatigue.

Keywords: Pulmonary, rehabilitation, based care bundle and chronic obstructive pulmonary disease

Introduction

Chronic obstructive pulmonary disease (COPD) is a common, chronic lung disease characterized by progressive and not fully reversible airflow limitation. Acute exacerbations of COPD are defined by worsening in patients' baseline symptoms of dyspnea, cough and sputum (quantity and purulence); exacerbations become more frequent and severe as the disease progresses. These events constitute the single most important determinant of health status in patients with COPD and account for increased morbidity, frequent emergency department (ED) visits, hospitalizations and death. (Hurst *et al*., 2010) [11].

A cornerstone of COPD management is preventing acute exacerbations of COPD and breaking the cycle of recurrence. A large body of evidence supports both pharmacological and non-pharmacological interventions to reduce the risk of acute exacerbations of COPD and improve overall health status. Despite this evidence, important care gaps remain as patients are often discharged from hospital or the ED following an acute exacerbation of COPD with no clear plan to prevent future episodes. Information exchange between hospital, ED and primary care physicians about the acute exacerbation of COPD is often incomplete or unavailable at the first post discharge outpatient appointment. (Criner *et al*., 2015) [6].

Often, patients and families assume care coordination responsibilities and personally convey follow-up instructions to primary care physicians. Information is sometimes provided verbally, and patients often struggle with health literacy issues. This creates a critical situation in which inaccurate information is translated from acute to community care settings. There is a need to improve transitions of care for patients with COPD across ED, hospital and community settings and ensure coordination and continuity of care. (Boulet *et al*., 2013) [3].

Care bundles aim to meet these challenges and overcome inconsistencies in clinical decision-making while supporting the translation of evidence to enhance COPD care. The Institute for Healthcare Improvement has defined care bundles as 'a structured way of improving the processes of care and patient outcomes: a small, straightforward set of evidence-based practices that, when performed collectively and reliably, have been proven to improve patient outcomes'. A COPD discharge care bundle comprises a

short list of evidence-based interventions that should be implemented prior to discharge of all patients with acute exacerbations of COPD. (Hopkinson *et al*., 2012) [9].

A systematic review on the effectiveness of COPD discharge care bundles found moderate evidence that their implementation is likely to reduce readmissions after acute exacerbations of COPD. The review highlighted the importance of documenting the individual components of care bundles and understanding their interactions to influence patient outcomes. Ideally, the decision to include individual interventions in a COPD discharge bundle should be guided by best evidence, clinical expertise and patient values. Despite the existence of clinical practice guidelines for COPD, there is no consensus about the core COPD care items that should be implemented at discharge to ensure a smooth transition to the community and reduce the risk of relapse. This study describes the development of a discharge care bundle for patients with COPD that is based on evidence, consensus among clinical experts and patients' feedback. (Man *et al*., 2017) [13].

Significant of the study

Living with COPD can be challenging, as the disease dramatically impacts patients' daily life. Individuals with COPD undergo a high amount of activity restriction and dependency due to dyspnea or fatigue shortness of breathing, breathlessness or all symptoms. Severe exacerbations of COPD that lead to unscheduled visits/admissions to hospital result in the significant economic burden associated with the disease. These aforementioned reasons emphasize the need for more effective pulmonary rehabilitation program to improve patients' dyspnea, fatigue, functional status, quality of life and knowledge.

Aim of the study

To assess the effectiveness of the pulmonary rehabilitation as practiced based care bundle on improving dyspnea, fatigue, functional status, quality of life and knowledge for patients with chronic obstructive pulmonary disease.

Research hypothesis

Dyspnea, fatigue, functional status, quality of life and knowledge for patients with chronic obstructive pulmonary disease will be improved after the pulmonary rehabilitation application as practiced based care bundle.

Research design

Quasi experimental research design (pre posttest control trial)

Setting

This study was conducted at Chest Department, Aswan University Hospital.

Subjects

A purposeful sample of100 patients admitted to chest department at Aswan University Hospital during the period of October 2015 to September 2016 for patients suffering from COPD.

Two cohorts were analyzed those cared with application of pulmonary rehabilitation based care bundle for COPD (intervention: N= 50), versus those cared without application of pulmonary rehabilitation program (control: N= 50), respectively.

Inclusion criteria

The criteria for inclusion were:

- Diagnosis of COPD, according to the guidelines of the Global Initiative for Chronic Obstructive Lung Disease (GOLD)
- Absence of reversibility in a respiratory function test,
- Absence of a diagnosis of any other respiratory disease such as tuberculosis or cancer, Ability to understand the pulmonary rehabilitation program.

Tools

Seven tools were used for data collection they accomplished after reviewing the recent relevant literatures

Tool (I): Socio-demographic and medical clinical base line data

This tool was developed by the nursing researchers after reviewing of relevant literature. It was comprised of four parts including:-

Part I: Demographic characteristics questionnaire

It revealed data about the following items: patient's: age, gender, marital status, level of education, occupation……etc.

Part II: medical clinical base line data

It revealed all data about present, past health history, family history**,** and risk factors.

Tool (II): St. George's respiratory questionnaire (SGRQ) developed by (Joens, *et al*. 1991) [10]

The St George Respiratory Questionnaire (SGRQ) is a disease-specific instrument designed to measure three domains:

1. Symptoms (evaluate symptomatology including frequency of cough, sputum production wheeze, breathlessness, and duration & frequency of attack of breathlessness or wheeze),
2. Activity (addressed activities that causes breathlessness),
3. Impact (influences on employment, being in control of health, panic, stigmatization, and quality of life).

*For each domain and for the total questionnaire, the score ranges from:

Zero= no impairment)

100 = maximum impairment)

SGRQ presented high internal consistency with Cronbach's alpha statistics (> 0.7 in the subdomains and > 0.9 in the overall questionnaire).

A decrease of 4% in any domain considered a clinically significant difference.

Tool (III): The university of California, san Diego (UCSD) shortness of breath questionnaire (1995)

It is 24 items questionnaire that used to evaluate self-reported shortness of breath while performing variety of activities of daily living via asking patient to indicate the severity of breathlessness experienced on six point scale:

Zero= not at all to 5= maximal or unable to do because of breathlessness.
This questionnaire including:

- 21 items reflects different ADL associated with different level of exertion,
- 3 additional items revealed limitation of shortness of breath, fear of harm from overexertion, and fear of shortness of breath.

Scoring by summing responses across all 24 items for total score ranging from (0 to 120).

Tool (IV): The medical research council (MRC) breathlessness scale (Fletcher *et. al*., 1959) [8]

This scale used to assess the dyspnea grades. It grades the effect of dyspnea on activities of daily living.
It comprises five statements that describe almost the entire range of respiratory disability from none (Grade 1) to almost complete incapacity (Grade 5). The patients choose the number that best fits their level of activity.

Tool (V): dyspnea-12 questionnaire (Yorke, *et al*. 2010) [26]

Dyspnea was measured using the D-12, which comprises 12 items: 7 related to the quality of the sensation of dyspnea and 5 related to the emotional response to this sensation.
Each item was graded in terms of its intensity using a 4-point scale, with higher scores indicating greater severity.

Tool (VI): The multidimensional fatigue symptom inventory short form (MFSI-SF) (Stein *et al*., 2004) [21]

It consists of 30 items used to assess the multidimensional nature of fatigue. Patients indicated the extent to which they have experienced each symptom during the preceding one-week period (0 - not at all; 4- extremely).
Ratings are summed to obtain scores for 5 subscales (General fatigue, physical fatigue, emotional fatigue, mental fatigue, and vigor fatigue).
- General scale = sum of items 10, 12, 14, 17, 18, and 28.

- Physical scale = sum of items 2, 4, 6, 16, 19, and 26.
- Emotional scale = sum of items 3, 8, 13, 21, 23, and 30.
- Mental scale = sum of items 1, 11, 15, 20, 25, and 27.
- Vigor scale = sum of items 5, 7, 9, 22, 24, and 29
- Total score = (General + Physical + Emotional + Mental) –Vigor.

Tool (VII): Bristol COPD knowledge questionnaire (BCKQ) (White, *et al*. 2006) [24]

This questionnaire is designed to assess patient' knowledge regarding COPD. It is self-administer, multiple choice question.
Consists of 13 topics regarding COPD containing (5) statements for which there is right or wrong answer giving a total of 65 questions.
These topics covered epidemiology and physiology, etiology, common symptoms, breathlessness, sputum, chest infections, exercise, smoking, immunization, inhaled bronchodilators, antibiotics, oral steroids and inhaled steroids. Correct responses to questions were scored 1 and 0 otherwise. The total or percentage of items correctly endorsed is then calculated.

Scoring system

Patient respond to statement with true or false or don't know each question was scored as:

- Incorrect answer = zero
- Inadequate answer = zero
- Correct answer = 1

The total score for knowledge was (65), in which total score is calculated by summating the number of correct responses (minimum score= 0; maximum score= 65). The score can be then converted to percentage.
The total score was calculated by (Cosgrove, et.al. 2013) [5] as following:

- Satisfactory if the score ≥ 60 of maximum score.
- Unsatisfactory if the score < 60 of the maximum score.

Methods

Study Was Conducted Through

1. An official permission to carry out the study was obtained from responsible authorities at Faculty of Nursing at Aswan University. Then, the permission was obtained from the hospital administrative authority.
2. The purpose of the study was explained to the patients and their consent to participate was obtained and those who were willing to participate were given a questionnaire to answer it. They were also assured of their anonymity and the confidentiality of their responses.
3. Pilot study was conducted on 10% of patients. This number was excluded from the studied sample to identify the obstacles and problems that may be encountered in data collection, applicability and feasibility of the developed tools.

Field work

The study was done from the beginning of October 2015 to September 2016. Data were collected by the nursing researcher three days per week, during the morning shift by rotation on chest department at Aswan University Hospital from 9am to 2 pm.

Data collection lasted for 12 month as following

Pre intervention of the pulmonary rehabilitation program (pretest):
Eight months from October 2015 to May 2016 for collecting base line date about two groups of the study (control group and study group), by using all tools mentioned before to reveal the severity of dyspnea, level of fatigue, functional status, patient's knowledge and health related quality of life for all patients.

The pulmonary rehabilitation program application (Intervention phase)

- Intervention group engage on pulmonary rehabilitation program for 3 days per week for 12 weeks.
- The program divided into two parts: Educational part and training and workout sessions.

A. The educational activities aimed at

- Improving self-management skills,
- Increasing patient understanding of pulmonary pathophysiology and the mechanism of breathlessness,
- Identifying and dealing with breathlessness,
- Teaching of methods for clearing pulmonary secretions,
- Spreading awareness about the importance of good

nutrition,
- Providing instruction on the use of respiratory medicines and oxygen,
- Teaching patients how to exercise at home, and how to apply the lessons of the rehabilitation program in daily life,
- Optimal physical exercise,
- Social rights for pulmonary patients,
- Optimizing conventional therapy,
- Psychosocial management,
- Smoking cessation,
- Respiratory muscle training,
- Respiratory physiotherapy, and coping skills.
- Patients also taught strategies to cope with breathlessness, breathing control and energy conservation techniques.
- Each session took approximately 30 to 45 minutes.
- Exercise sessions consisted of stretching, breathing retraining, relaxation, and chest mobility exercises (3 session per week, about 30 to 45 minutes) of exercise, with rest periods in between.
- Patients were encouraged to exercise at home between hospital sessions according to an exercise diary given by the researcher to document the type and amount of exercise performed each day.
- Exercise diaries were returned to researcher weekly.

B. The exercise training sessions were composed of
- A warm-up and a cool-down period including range of-motion, stretching, low-intensity aerobic exercises and breathing techniques (5–10 min).
- Endurance training (walking and cycling) at 60–80% of the average speed for 20 minutes.
- Strength training including 7 exercises (2 sets of 10 repetitions) of the major upper and lower limb muscle groups using free weights and ankle weights (15 min).
- Subjects were prescribed exercises to improve muscular strength/endurance of major muscle groups of the upper (biceps, triceps, deltoid, rhomboids, and pectoralis major, and trapezius muscles) and lower (quadriceps, hamstring, gluteal, hip abductor, gastrocnemius, and soleus muscles) limbs.
- Exercises were performed in both sitting and standing positions. Free weights, body weight, and elastic tubing were used for resistance.
- Balance training consisting of static and dynamic exercises using upright positions (5 min).

Post application of the pulmonary rehabilitation program (post test**)**

The other four months from June 2016 to September 2016 for evaluation of the improvement of dyspnea, level of fatigue, functional status, patient's knowledge and health related quality of life for all patients after application of pulmonary rehabilitation program by using all tools mentioned before, this period consider as post-intervention phase (posttest) for two group of the study.

Ethical consideration

The research proposal was approved from ethical committee of the faculty of nursing; confidentiality and privacy of the study were asserted. An written consent was taken from the patients. Clarification of the nature and the aim of the study were done in initial interview with patient, with an emphasis that the study yields no harm to the subjects. The subjects had the right to refuse to participate in the study without any rational.

Statistical design

Data assembled from the participants by transposing the interview questionnaire and scattered the data using a commercial software platform. The results of the survey responses from the participants were converted into a Microsoft Office Excel spreadsheet, which was a feature offered through a commercial qualitative analysis software program (SPSS version 20), which coded and analyzed the data.

Results

Table 1: Distribution of socio demographic data for studied group

	Study(n=50)		Control(n=50)		P. value
	No.	%	No.	%	
Age	50.30±6.08		49.36±7.87		0.506
Sex					
Male	37	74.0	31	62.0	0.198
Female	13	26.0	19	38.0	
Educational					
Illiterate	22	44.0	26	52.0	0.947
read and write	12	24.0	10	20.0	
Primary	6	12.0	6	12.0	
Secondary	5	10.0	4	8.0	
University	5	10.0	4	8.0	
Occupation					
not working	19	38.0	12	24.0	0.375
Employee	5	10.0	5	10.0	
house wife	9	18.0	15	30.0	
Worker	17	34.0	18	36.0	

Chi-square test

Table (1) showed that there was no statistical significance difference between study and control group regarding demographic data. The large percentage of them were male, illiterate and not work (74, 76, 44 and 38% respectively)

Table 2: Distribution of the Studied Patients According to medical clinical base line data for studied groups

	Study(n=50)		Control(n=50)		P. value
	No.	%	No.	%	
Present health history					
<1year	14	28.0	14	28.0	1.000
>1year	36	72.0	36	72.0	
Chronic disease					
Hypertension	11	22.0	19	38.0	0.081
DM	7	14.0	13	26.0	0.134
GIT disturbances	5	10.0	9	18.0	0.249
Musculoskeletal disorders	3	6.0	7	14.0	0.182
Atherosclerosis	2	4.0	6	12.0	0.140
Liver disease	6	12.0	9	18.0	0.401
Clinical picture of COPD					
Shortness of breathing	44	88.0	44	88.0	1.000
Productive cough	41	82.0	41	82.0	1.000
Sever fatigue	44	88.0	44	88.0	1.000
Chest wheezing	39	78.0	39	78.0	1.000
Sever loss of weight	22	44.0	19	38.0	0.542
Stress restlessness	33	66.0	39	78.0	0.181
Insomnia	45	90.0	26	52.0	0.000
Smoking habit					
Smoker	12	24.0	9	18.0	0.625
Previous smoking	24	48.0	21	42.0	
Non	14	28.0	20	40.0	
smoking year					
Non	14	28.0	20	40.0	0.432
<20 year	18	36.0	16	32.0	
more than 20 year	18	36.0	14	28.0	
type of smoking					
Non	14	28.0	20	40.0	0.562
Cigarette	20	40.0	18	36.0	
Shisha	16	22.0	12	24.0	
passive smoking					
No	15	30.0	22	44.0	0.147
Yes	35	70.0	28	56.0	
Environmental pollution					
No	10	20.0	15	30.0	0.248
Yes	40	80.0	35	70.0	
Allergy					
No	21	42.0	19	38.0	0.683
Yes	29	58.0	31	62.0	
Family history of COPD					
No	43	86.0	39	78.0	0.298
Yes	7	14.0	11	22.0	

- Chi-square test, ** Significant difference at p. value<0.01

Table (2) showed that there were no statistical significant difference between study and control group regarding present and family health history except when asked about clinical picture of COPD specially “insomnia”. in addition the table illustrated that the majority of patients were suffering from COPD from more than an year and hypertension, they also Cigarette smokers from 20 years ago, passive smokers, live in an polluted environment, have allergy and no COPD family history(72.0%, 22.0%, 48.0%, 36.0%, 40,0%, 70.0%, 80.0%, 58.0%, and 86.0% respectively)

Table 3: Distribution of studied groups scores of St. George’s Respiratory Questionnaire (SGRQ).

	Study(n=50)		Control(n=50)	
	No	%	No	%
Describe how often your lung/respiratory problems have affected you over the last 4 weeks. Please place a mark in one box for each question.				
SGRQ cough				

most days a week	12	24.0	9	18.0
several days a week	25	50.0	27	54.0
A few days a week	4	8.0	4	8.0
only with chest infection	2	4.0	2	4.0
not at all	7	14.0	8	16.0
SGRQ sputum				
most days a week	6	12.0	6	12.0
several daya a week	44	88.0	44	88.0
SGRQ shortness				
most days a week	13	26.0	13	26.0
several daya a week	31	62.0	31	62.0
not at all	6	12.0	6	12.0
SGRQ wheezin				
several daya a week	15	30.0	15	30.0
afew days a week	35	70.0	35	70.0
During the last 4 weeks, how many severe or very unpleasant episodes of lung/respiratory problems have you had? Mark one answer only				
SGRQ attack				
3 attacks	13	26.0	13	26.0
2 attacks	24	48.0	24	48.0
one attack	6	12.0	6	12.0
no attack	7	14.0	7	14.0
SGRQ duration				
Non	7	14.0	7	14.0
3 or more days	1	2.0	1	2.0
1 or 2 days	32	64.0	32	64.0
less than a day	10	20.0	10	20.0
SGRQ good day				
no good day	2	4.0	2	4.0
1 or 2 good days	17	34.0	17	34.0
3 or 4 good days	31	62.0	31	62.0
SGRQ morning				
No	20	40.0	20	40.0
Yes	30	60.0	30	60.0
How long did the worst episode of lung/respiratory problem last?				
most important problem i have	2	4.0	2	4.0
causes me a lot of problems	45	90.0	45	90.0
causes a few problems	3	6.0	3	6.0
SGRQ employee				
Non	27	54.0	30	60.0
my chest trouble interfere with my work or made me change my work	8	16.0	8	16.0
my chest trouble dose not affect my work	15	30.0	12	24.0

- Chi-square test, ** Significant difference at p. value<0.01

Table (3) revealed that patients had worse scores for disease specific quality of life measured on the SGRQ as a base line data.

Table 4: Distribution participants correct responses after the rehabilitation program for all 65 items and their indexed by topic (13 topics) and their five stems (a, b, c, d, e) of Bristol COPD Knowledge Questionnaire (BCKQ)

BCKQ	Study										Control									
	A		B		C		D		E		A		B		C		D		E	
	No	%	No	%	No	%	No	%	No	%	No	%	No	%	No	%	No	%	No	%
1. Epidemiology	35	70.0	34.0	68.0	32.0	64.0	31.0	62.0	31.0	62.0	22	44.0	16.0	32.0	26.0	52.0	23.0	46.0	19.0	38.0
2. Aetiology	35	70.0	34.0	68.0	32.0	64.0	31.0	62.0	31.0	62.0	22	44.0	16.0	32.0	26.0	52.0	23.0	46.0	19.0	38.0
3. Symptoms	35	70.0	34.0	68.0	32.0	64.0	31.0	62.0	31.0	62.0	22	44.0	16.0	32.0	26.0	52.0	23.0	46.0	19.0	38.0
4. Breathlessness	35	70.0	34.0	68.0	32.0	64.0	31.0	62.0	31.0	62.0	22	44.0	16.0	32.0	26.0	52.0	23.0	46.0	19.0	38.0
5. Phlegm	35	70.0	34.0	68.0	32.0	64.0	31.0	62.0	31.0	62.0	22	44.0	16.0	32.0	26.0	52.0	23.0	46.0	19.0	38.0
6. Infections	35	70.0	34.0	68.0	32.0	64.0	31.0	62.0	31.0	62.0	22	44.0	16.0	32.0	26.0	52.0	23.0	46.0	19.0	38.0
7. Exercise	35	70.0	34.0	68.0	32.0	64.0	31.0	62.0	31.0	62.0	22	44.0	16.0	32.0	26.0	52.0	23.0	46.0	19.0	38.0
8. Smoking	35	70.0	34.0	68.0	32.0	64.0	31.0	62.0	31.0	62.0	22	44.0	16.0	32.0	26.0	52.0	23.0	46.0	19.0	38.0
9. Vaccination	35	70.0	34.0	68.0	32.0	64.0	31.0	62.0	31.0	62.0	22	44.0	16.0	32.0	26.0	52.0	23.0	46.0	19.0	38.0
10. Inhaled Bronchodilators	35	70.0	34.0	68.0	32.0	64.0	31.0	62.0	31.0	62.0	22	44.0	16.0	32.0	26.0	52.0	23.0	46.0	19.0	38.0
11. Antibiotic treatment	35	70.0	34.0	68.0	32.0	64.0	31.0	62.0	31.0	62.0	22	44.0	16.0	32.0	26.0	52.0	23.0	46.0	19.0	38.0
12. Steroid tablets given for COPD (e.g. prednisolone)	35	70.0	34.0	68.0	32.0	64.0	31.0	62.0	31.0	62.0	22	44.0	16.0	32.0	26.0	52.0	23.0	46.0	19.0	38.0
13. Inhaled Steroids. (brown, red or orange)	35	70.0	34.0	68.0	32.0	64.0	31.0	62.0	31.0	62.0	22	44.0	16.0	32.0	26.0	52.0	23.0	46.0	19.0	38.0

Table (4) summarized the percentage of items scored correctly by the studied both groups after application the rehabilitation program. This table reveals. Analysis of individual questions for the education group showed that some topics were consistently scored highly whereas in others there was poor level of knowledge and beliefs. All items of the Bristol COPD Knowledge Questionnaire (BCKQ) scale the patients answered correctly on all items of the scale as the stem score as following (a= 70%, b=68%, c=64%, d= 62%, e=62% respectively). There was overall improvement of all items percentage points after rehabilitation program application. In other hand, the control group scores were not improved.

Table 5: Distribution participants giving a correct response after the rehabilitation program for Dyspnea-12 Questionnaire

Dyspnea-12 Questionnaire	Study			Control		
	Pre	Post	P. value	Pre	Post	P. value
physical: dyspnea severity	16.08±6.08	9.84±4.15	<0.001**	16.08±6.08	15.26±5.36	0.476
affective dyspnea severity	11.6±4.38	4.16±2.18	<0.001**	11.6±4.38	11.46±4.02	0.868
Total dyspnea severity	27.68±10.4	14±5.47	<0.001**	27.68±10.4	26.72±9.19	0.626

- independent t-test ** Significant difference at p. value<0.01

Table (5) showed that a highly significant differences between pre and post application of rehabilitation program but there were no statistical difference in control group regarding Dyspnea-12 Questionnaire. The mean score of in subjects without any previous education indicates that overall knowledge was poor

Table 6: Distribution of the Studied groups according to baseline Medical Research Council (MRC) Breathlessness Scale

MRC	Study (n=50)		Control(n=50)	
	No	%	No	%
not troubled by breathlessnessexcept on strenous exercise	1	2.0	1	2.0
short of breath when hurrying or walking up slight hill	3	6.0	3	6.0
walks slower than contemporary on level ground	24	48.0	24	48.0
stop for breath after walking about 100 m	18	36.0	18	36.0
too breathlessness to leave house	4	8.0	4	8.0
Mean ± SD(range)	2.4±0.8(0-4)		2.4±0.8(0-4)	

Table (6) showed that the mean total score of MCR for both groups was equal and very low before the application of the rehabilitation program (2.4±0.8)

Table 7: Distribution of studied groups means of scores of the Multidimensional Fatigue Symptom Inventory Short Form (MFSI-SF) scale

MFSI-SF scale	Study			Control		
	pre	Post	P. value	pre	Post	P. value
General scale	14.88±3.13	9.24±2.15	<0.001**	14.88±3.13	11.92±2.66	<0.001**
Physical scale	13.52±2.49	8.28±1.83	<0.001**	13.52±2.49	12.84±2.23	0.154
Emotional scale	15.46±2.43	7.88±1.62	<0.001**	15.46±2.43	13.64±2.7	0.001**
Mental scale	14.3±2.23	7.02±2.18	<0.001**	14.3±2.23	12±2.56	<0.001**
Vigor scale	5.74±1.79	12.86±2.41	<0.001**	5.74±1.79	6.32±2.15	0.146
Total MFSI-SF	58.16±5.77	32.42±3.66	<0.001**	58.16±5.77	50.4±5.53	<0.001**

- independent t-test ** Significant difference at p. value<0.01

Table (7) illustrated that there were statistical significant difference between pre- post in both study and control group regarding MFSI-SF scale except physical and vigor scale, in addition the total level of fatigue decreased after application of the rehabilitation program among the studied groups.(Higher scores indicate more fatigue)

Table 8: Distribution of the mean scores of studied groups of Shortness of Breath Questionnaire (UCSD)

Shortness of Breath Questionnaire	Study			Control		
	pre	Post	P. value	Pre	post	P. value
When I do, or if I were to do, the following tasks, I would rate my shortness of breath as:	29.68±11.18	19.06±8.21	<0.001**	29.68±11.18	27.06±9.4	0.208
When I do, or if I were to do, the following tasks, I would rate my shortness of breath as:	39.5±12.77	32.18±11.63	<0.001**	40.72±11.49	39.42±11.19	0.568
How much do these limit you in your daily life?	11.9±4.46	8.52±3.87	<0.001**	11.9±4.46	11.52±4.06	0.657
Total SOB	81.08±27.6	59.76±21.07	<0.001**	82.3±25.99	78±23.46	0.387

- independent t-test ** Significant difference at p. value<0.01

Table (8) demonstrated that total mean scores of Shortness of Breath Questionnaire (USCD) were decrease after the application of the rehabilitation program in both groups but there was a highly statistical significant difference among the study group only.

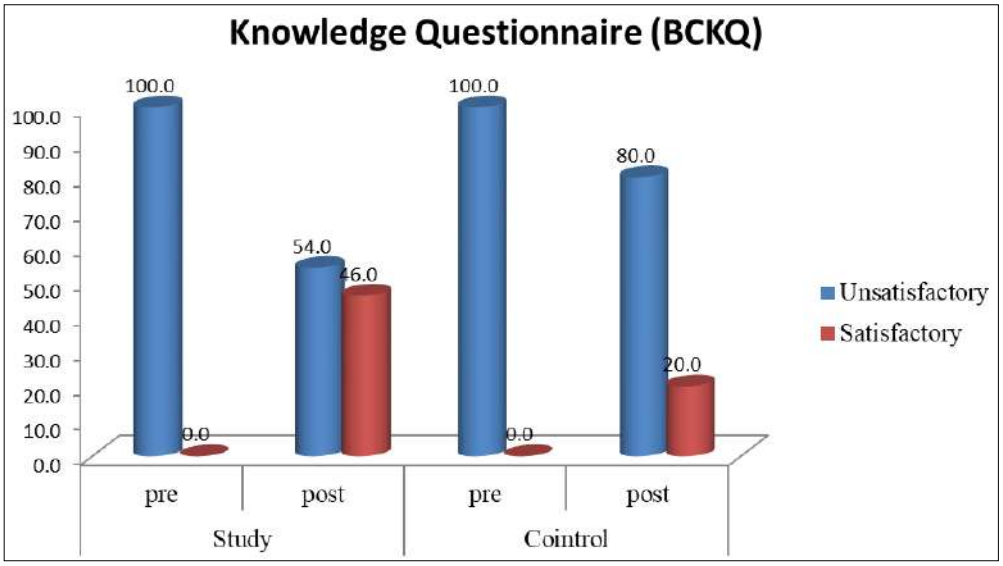

Fig 1: Distribution of studied groups mean scores of knowledge questionnaire (BCKQ)

figure (1) illustrated that the total score regarding knowledge questionnaire (BCKQ) for f both groups before the application of the rehabilitation program was zero, and the score increased after the application but it increased in study group than control group.

Table 9: Correlation between (dyspnea severity, MFSI-SF and Knowledge Questionnaire (BCKQ) total scores.

Total UCSD	R	P
When I do, or if I were to do, the following tasks, I would rate my shortness of breath as:	0.959	<0.001**
When I do, or if I were to do, the following tasks, I would rate my shortness of breath as:	0.945	<0.001**
How much do these limit you in your daily life?	0.935	<0.001**
Total dyspnea severity		
physical:dyspnea severity	.979**	<0.001**
affective dyspnea severity	.969**	<0.001**
Total MFSI-SF		
General scale	0.690	<0.001**
Physical scale	0.814	<0.001**
Emotional scale	0.885	<0.001**
Mental scale	0.863	<0.001**
Knowledge Questionnaire (BCKQ)		
Epidemiology	1.000	<0.001**
Aetiology	1.000	<0.001**
Symptoms	1.000	<0.001**
Breathlessness	1.000	<0.001**
Phlegm	1.000	<0.001**
Infections	1.000	<0.001**
Exercise	1.000	<0.001**
Smoking	1.000	<0.001**
Vaccination	1.000	<0.001**
Inhaled Bronchodilators	1.000	<0.001**
Antibiotic treatment	1.000	<0.001**
"Steroid tablets given for COPD (e.g. prednisolone)"	1.000	<0.001**
Inhaled Steroids. (brown, red or orange)	1.000	<0.001**

** Statistically significant correlation (p<0.01)

Table (9) revealed that there were a statistical positive correlation between all items (dyspnea severity, MFSI-SF and Knowledge Questionnaire (BCKQ) total scores.

Discussion

Care bundles were originally developed to improve adherence to clinical practice guidelines and to decrease variations in care; however, consistent uptake of recommendations from clinical practice guidelines into care bundles remains challenging. For example, in North America, the American College of Chest Physicians (CHEST) and the CTS have developed recommendations about both pharmacological and non-pharmacological treatments to prevent acute exacerbations of COPD. (Zafar *et al*., 2017) [27].

The aim of this study was to assess the effectiveness of pulmonary rehabilitation as practiced based care bundle on improving dyspnea, fatigue, functional status, quality of life and knowledge for patients with chronic obstructive pulmonary disease.

Regarding characteristics of the patients under study, it was found that there was no statistical significance difference between study and control group regarding demographic data. The large percentage of their ages means 50.30±6.08, male, illiterate and not work (74, 76, 44 and 38% respectively)

This finding is inconsistent with (Tel, *et al*. 2012) [23] who found out that mean age of the COPD patients in their study was 66.03 years (SD= 11.33). Most of the study sample was male; this finding is congruent with Mohamed (2005) [16] who found that, all of the study sample were male. Nearly one third of the study sample was not work, this finding not in the same line with the studies who found that the high prevalence of COPD between blue collar who are exposed to irritants at their work place which are inhaled into their lungs causing serious lung damage as most of those patients were working.

The study showed that there were no statistical significant difference between study and control group regarding present and family health history except when asked about clinical picture of COPD specially "insomnia". in addition the table illustrated that the majority of patients were suffering from COPD from more than an year and hypertension, As regards the clinical characteristics of the studied subjects it was found that more than half of the patients had a disease more than 1 years and had a stage II COPD (moderate), and less than half of them were hospitalized before. This result was similar to Baghai–Ravary *et al*. (2009) [1] who stated that, hospitalization rates in the patients with COPD are high, and increase with age. Also, similar to Tel *et al*. (2012) [23] who illustrated that, high fatigue score and score of the daily activities affected by fatigue were presented by those who had the COPD for ≥ 12 years they also Cigarette smokers from 20 years ago, passive smokers, live in an polluted environment, have allergy and no COPD family history.

This result is in the same line with National Heart, Lung, and Blood Institute (2013), who found that COPD most often occurs in people with a history of smoking (either current or former smokers). Also, as many as one out of six people with COPD never smoked.

The best combination to rule out airflow obstruction was absence of a smoking history and no evidence of wheezing on either history or physical examination. It is a history of greater than 40 pack-years of smoking. A combination of findings was more helpful for diagnosing airflow obstruction than was any individual sign, symptom, or piece of historical information.

Patients also had worse scores for disease specific quality of life measured on the SGRQ, which showed in the present study. (Tageldin *et al*. 2012) [22] Provided information on respiratory health-related quality of life as measured by the St. George's Respiratory Questionnaire. All studies demonstrated a statistically significant improved quality of life.

Concerning the total patients' knowledge, the percentage of items scored correctly by the studied both groups after application the rehabilitation program. This table reveals. Analysis of individual questions for the education group showed that some topics were consistently scored highly whereas in others there was poor level of knowledge and beliefs. All items of the Bristol COPD Knowledge Questionnaire (BCKQ) scale the patients answered correctly on all items of the scale as the stem score as following (a= 70%, b=68%, c=64%, d= 62%, e=62% respectively). There was overall improvement of all items percentage points after rehabilitation program application. In other hand, the control group scores were not improved. It might be thought that patients with more severe disease or with longer duration of disease would have greater knowledge of their condition because of greater exposure to health professionals, but there was no evidence of this. Similarly we did not find that age, social class or socio-economic status influenced the degree of knowledge.

The finding of this study was congruent with Cleary *et al*. (2012) who stated that, many people who firstly diagnosed with COPD report feeling confused and worried, that are relieved when they have an explanation and more information for their breathlessness and other symptoms.

The present study illustrated that a highly significant differences between pre and post application of rehabilitation program but there were no statistical difference in control group regarding Dyspnea-12 Questionnaire. The mean score of in subjects (control group) without any previous education indicates that overall knowledge was poor.

Dyspnea is the reason most patients with chronic obstructive pulmonary disease (COPD) seek medical attention. As lung function deteriorates, dyspnea becomes more intrusive, but the subjective experience of dyspnea may also be influenced by psychological distress. (Farver-Vestergaard *et al*. 2016)[7].

Studies infrequently reported dyspnea scores, and when these were reported, a small improvement with monotherapies was typically demonstrated. Reasons for not reporting dyspnea scores include no acceptable and appropriate approach to assess dyspnea in a clinical trial setting and a lack of a uniform method. The Lung Health Study found a statistically significant benefit in reducing the frequency of dyspnea in patients who were assigned to receive inhaled corticosteroids versus placebo (68% vs. 62%, respectively, reported no dyspnea at 36 months; P = 0.02) (Michele *et al*., 2010) [14].

Wong *et al*., (2010) [25] mentioned that; after completing a pulmonary rehabilitation program, patients with high fatigue showed a similar improvement in their dyspnea and Muscle atrophy and weakness are frequent in patients with COPD45 and are associated with the perception of muscle fatigue during exercise and thus to exercise intolerance Scott *et al*., (2010) [15] who found that, 53.3% of participants in their study are reporting dyspnea at a Grade 3 level Fatigue may be affected by dyspnea and is frequently told by the COPD patients.

This study showed that the mean total score of Medical Research Council (MRC) Breathlessness Scale for both groups was equal and very low before the application of the rehabilitation program (2.4±0.8) this study was in the same line with Jolley *et al*., (2015) [12] who mentioned that the significantly to breathlessness intensity over an awareness of levels of neural respiratory drive alone.

This study illustrated that there were a statistical significant difference between pre- post in both study and control group regarding MFSI-SF scale except physical and vigor scale, in addition the total level of fatigue decreased after application of the rehabilitation program among the studied groups were

higher scores indicate more fatigue). Baltzan *et al*., (2011) [2] mention that Patients with chronic obstructive pulmonary disease (COPD) complain of dyspnea and fatigue. High fatigue was present in (39%) of patients. Also founded that patients with COPD in a trial of pulmonary rehabilitation, 39% of individuals had high levels of fatigue compared to the age matched population. This findings are not similar to those of Wong *et al*., (2010) [25] Who found that physical fatigue was the dimensions that most negatively rated by persons with COPD.

The study showed that total mean scores of Shortness of Breath Questionnaire (USCD) were decrease after the application of the rehabilitation program in both groups but there was a highly statistical significant difference among the study group only. Rehman *et al*., (2017) [18] mentioned that; it was acceptable to participants with at least moderate COPD eligible for Pulmonary Rehabilitation, and markedly improved dyspnea and shortness of breathing and critical aspects of health-related QOL for participants with COPD.

The present research illustrated that the total score regarding Knowledge Questionnaire (BCKQ) for both groups before the application of the rehabilitation program was zero, and the score increased after the application but it increased in study group than control group (42.38±12.82, and 27.56±14.77 respectively) The subjects who did not enter the education programme showed a small but statistically significant increase in scores at follow-up. This small increase may be due to non-intervention respondents having a renewed interest in knowledge of COPD and corresponds to non-intervention subjects correctly answering an additional two or three questions on average at follow-up compared with baseline. Note however that this small increase is not due to any particular items showing consistent systematic improvement but is spread across the items. (White *et al*., 2006) [24].

Finally, the finding illustrated that there were a statistical positive correlation between all items (dyspnea severity, MFSI-SF and Knowledge Questionnaire (BCKQ) total scores. This in compatible with Salah *et al*., (2013) [19] who found that there were relationship between dyspnea severity and patient's knowledge.

Conclusion

Based on the results of the current study, it can be concluded that

Implementation of the pulmonary rehabilitation program had improved COPD patients' level of knowledge, dyspnea, dimensions of fatigue and shortness of breathing and breathlessness level.

Recommendations

Based on the results of this study, the following recommendations are suggested

- Conducting comprehensive rehabilitation programs for patients with COPD in outpatients' clinics with simplified printed guidelines through leaflets or brochures explaining how to prevent and control breathlessness and fatigue.
- Further evaluation of the effect of rehabilitation programs to prevent and ameliorate breathlessness and fatigue intensity and distress responses in larger sample of COPD patients in order to generalize the results.
- A home-based program should be done to effectively improve the breathlessness, the fatigue, knowledge and quality of life among the patient with COPD.

References

1. Baghai–Ravary R, Quint JK, Goldring JJP, Hurst JR, Donaldson GC, Wedzicha JA. Determinatnts and impact of fatigue in patients with chronic obstructive pulmonary disease. Respiratory Medicine. 2009; 103:216-223.
2. Baltzan MA, Scott AS, Wolkove N, Bailes S, Bernard S, Bourbeau J. Canadian COPD. Fatigue in COPD: Prevalence and effect on outcomes in pulmonary rehabilitation. Chronic Respiratory Disease, 2011, 119-128.
3. Boulet LP, Bourbeau J, Skomro R. Major care gaps in asthma, sleep and chronic obstructive pulmonary disease: a road map for knowledge translation. Can Respir J. 2013; 20:265-9. doi:10.1155/2013/496923
4. Cleary M, Serisier D *et al*. Better Living with Chronic Obstructive Pulmonary Disease: A Patient Guide, 2nd ed., The Australian Lung Foundation, Queensland Government, 2012, 11-12
5. Cosgrove D, MacMahon J, Bourbeau J, Bradley JM, O'Neill B. Facilitating education in pulmonary rehabilitation using the living well with COPD programme for pulmonary rehabilitation: a process evaluation. BMC pulmonary medicine. 2013; 13(1):1.
6. Criner GJ, Bourbeau J, Diekemper RL. Prevention of acute exacerbations of COPD: American college of chest physicians and Canadian thoracic society guideline. Chest. 2015; 147:894-942. doi:10.1378/chest.14-1676
7. Farver-Vestergaard I, Ottesen AL, Bendstrup E, O'Connor M, Zachariae R. Exploring the association between psychological distress and dyspnea in COPD., European Respiratory Journal. 2016; 48(60):723.
8. Fletcher CM, Elmes PC, Fairbairn AS, Wood CH. Significance of respiratory symptoms and the diagnosis of chronic bronchitis in a working population. British Medical Journal. 1959; 2(5147):257.
9. Hopkinson NS, Englebretsen C, Cooley N. Designing and implementing a COPD discharge care bundle. Thorax. 2012; 67:90-2. doi:10.1136/thoraxjnl-2011-200233
10. Jones PW, Quirk FH, Baveystock CM. The St George's respiratory questionnaire. Respiratory medicine. 1991; 85:25-31.
11. Hurst JR, Vestbo J, Anzueto A. Susceptibility to exacerbation in chronic obstructive pulmonary disease. N Engl J Med. 2010; 363:1128-38. doi:10.1056/NEJMoa0909883
12. Jolley CJ, Luo YM, Steier J, Rafferty GF, Polkey MI, Moxham J. Neural respiratory drive and breathlessness in COPD. European Respiratory Journal. 2015; 45(2):355-364.
13. Man WD, Barker R, Maddocks M. Outcomes from hospitalised acute exacerbations of COPD: a bundle of optimism? Thorax. 2017; 72:8-9. doi:10.1136/thoraxjnl-2016-209212
14. Michele TM, Pinheiro S, Iyasu S. The safety of tiotropium-the FDA's conclusions. N Engl J Med. 2010,

36310979.
15. Scott A, Baltzan MA, Fox J *et al*. Success in pulmonary rehabilitation in patients with chronic obstructive pulmonary disease. Can Respir J. 2010; 17:219-223.
16. Mohamed A. Pulmonary Rehabilitation: Selfcare Strategies for Chronic Obstructive Pulmonary Disease Patients, Doctorate thesis in nursing science, Medical-Surgical Nursing, Faculty of Nursing, Ain Shams University, 2005.
17. National Heart, Lung, and Blood Institute, Copd are you at risk? [Last updated 2011 accessed, 2013, 11.
18. Rehman H, Karpman C, Douglas KV, Benzo RP. Effect of a Motivational interviewing-based health coaching on quality of life in subjects with COPD. Respiratory care, respcare-04984, 2017.
19. Salah M, Hamdi A, Shehata H. Improving breathlessness and fatigue in patient with COPD. Journal of American Science. 2013; 9(12):470-482.
20. Scott A, Baltzan MA, Fox J *et al*. Success in pulmonary rehabilitation in patients with chronic obstructive pulmonary disease. Can Respir J. 2010; 17:219-223.
21. Stein KD, Jacobsen PB, Blanchard CM, Thors C. Further validation of the multidimensional fatigue symptom inventory-short form. Journal of pain and symptom management. 2004; 27(1):14-23.
22. Tageldin MA, Nafti S, Khan JA, Nejjari C, Beji M, Mahboub B *et al*. Distribution of COPD-related symptoms in the Middle East and North Africa: results of the Breathe study. Respir Med. 2012; 106(2):S25-32. doi: 10.1016/S09546111(12)70012-4
23. Tel H, Bilgiç Z, Zorlu Z. Evaluation of Dyspnea and Fatigue among the COPD Patients, Chronic Obstructive Pulmonary Disease - Current Concepts and Practice, 2012. Available at: http://www.intechopen.com/ books/chronicobstructivepulmonary-disease- current-concepts-and practice/evaluation-of-dyspnea-and-fatigue-amongthe-copd patients
24. White R, Walker P, Roberts S, Kalisky S, White P. (Bristol COPD Knowledge Questionnaire (BCKQ): testing what we teach patients about COPD. Chronic respiratory disease. 2006; 3(3):123-131.
25. Wong C, Goodridge D, Marciniuk D, Rennie D. Fatigue in patients with COPD participating in a pulmonary rehabilitation program. International Journal of Chronic Obstructive Pulmonary Disease. 2010; 5:319-326.
26. Yorke J, Moosavi SH, Shuldham C, Jones PW. Quantification of dyspnoea using descriptors: development and initial testing of the Dyspnoea-12. Thorax. 2010; 65(1):21-26.
27. Zafar MA, Panos RJ, Ko J. Reliable adherence to a COPD care bundle mitigates system-level failures and reduces COPD readmissions: a system redesign using improvement science. BMJ Qual Saf. 2017; 26:908-18. doi:10.1136/bmjqs-2017-006529